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(54) Title: METHODS FOR RAPID FORENSIC DNA ANALYSIS

(57) Abstract: The present invention provides methods and primer pairs for rapid, high-resolution forensic analysis of DNA and STR-typing by using amplification and mass spectrometry, determining the molecular masses and calculating base compositions of amplification products and comparing the molecular masses with the molecular masses of theoretical amplicons indexed in a database.



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INTERNATIONAL SEARCH REPORT

International application No
PCT/US2008/054926

A. CLASSIFICATION OF SUBJECT MATTER
INV. C12Q1/68

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

C12Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, EMBASE, BIOSIS, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 99/14375 A (GENETRACE SYSTEMS INC [US]; BUTLER JOHN M [US]; LI JIA [US]; MONFORTE) 25 March 1999 (1999-03-25)	1-10,17,30,62-77,110-113,115
Y	page 5, line 3 - page 7, line 23; table 1; claims; examples	31-33,86
X	HAHNER S ET AL: "Analysis of short tandem repeat polymorphisms by electrospray ion trap mass spectrometry" NUCLEIC ACIDS RESEARCH, OXFORD UNIVERSITY PRESS, SURREY, GB, vol. 28, no. 18, 15 September 2000 (2000-09-15), page E82; XP002343082 ISSN: 0305-1048 pages iv-v; table 2	1-11

☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents:

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

- *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- *G* document member of the same patent family

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INTERNATIONAL SEARCH REPORT

International application No

PCT/US2008/054926

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	<p>NULL A P ET AL: "Genotyping of simple and compound short tandem repeat loci using electrospray ionization Fourier transform ion cyclotron resonance mass spectrometry" ANALYTICAL CHEMISTRY, AMERICAN CHEMICAL SOCIETY, COLUMBUS, US, vol. 73, no. 18, 1 January 2001 (2001-01-01), pages 4514-4521, XP002229943 ISSN: 0003-2700 page 4518</p>	1-11, 62-64, 66,67
X	<p>-----</p> <p>BONK THOMAS ET AL: "Matrix-assisted laser desorption/ionization time-of-flight mass spectrometry-based detection of microsatellite instabilities in coding DNA sequences: a novel approach to identify DNA-mismatch repair-deficient cancer cells." CLINICAL CHEMISTRY APR 2003, vol. 49, no. 4, April 2003 (2003-04), pages 552-561, XP002493861 ISSN: 0009-9147 page 553-554; figures and tables</p>	1-11
X	<p>-----</p> <p>US 6 074 831 A (YAKHINI ZOHAR [US] ET AL) 13 June 2000 (2000-06-13) column 15, entry G; claims</p>	1-11
X	<p>-----</p> <p>EP 1 365 031 A (MTM LAB AG [DE]) 26 November 2003 (2003-11-26) examples and figures</p>	1-11
X	<p>-----</p> <p>WO 2006/089762 A (UNIV MAINZ JOHANNES GUTENBERG [DE]; BENDER KLAUS [DE]) 31 August 2006 (2006-08-31)</p>	78,85, 97,98, 100, 104-106
Y	<p>page 5, last paragraph; page 11, table; claims</p>	31-33,86
P,X	<p>-----</p> <p>OBERACHER H ET AL: "Increased forensic efficiency of DNA fingerprints through simultaneous resolution of length and nucleotide variability by high-performance mass spectrometry" HUMAN MUTATION 200803 US, vol. 29, no. 3, March 2008 (2008-03), pages 427-432, XP002493862 ISSN: 1059-7794 Results and discussion; figures</p>	1-12

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2008/054926

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This International search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:
1-11, 17, 62-78, 97-106, 110-113, 115 (in part); 12, 30-33
85-86 (entirely)

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/SA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

Invention 1: Claims 1-11, 17, 62-78, 97-106, 110-113, 115 (in part) and 12, 30-33, 85-86 (entirely)

Concern a method for STR typing comprising amplifying a nucleic acid using primers, determining the molecular mass of at least one amplification product by mass spectrometry and comparing the molecular mass to a database for matching to the STR allele; an oligonucleotide primer pair; a kit comprising such primer pair in particular wherein the method is typing the STR locus D5S818 and further in particular wherein the method is typing a STR allele which comprises at least one SNP.

Inventions 2-13: Claims 1-11, 13-29, 34-84, 87-106, 110-115 (in part)

Concern a method for STR typing comprising amplifying a nucleic acid using primers, determining the molecular mass to a least one amplification product by mass spectrometry and comparing the molecular mass to a database for matching to the STR allele, an oligonucleotide primer pair; a kit comprising such primer pair wherein, the method is typing the STR locus D8S21179, vWA, D13S317, D7S820, TH01, TPOX, CSF1PO, D16S539, FGA, D21S11, D18S51 or D3S respectively of the inventions.

Invention 14: Claims 107-109 entirely

Concern a kit for forensic analysis comprising at least two oligonucleotide primer pairs, one pair configured to hybridise to a region flanking a variable region comprising vWR and the second pair configured to hybridise within or flanking an AMEL locus.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2008/054926

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
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			EP 1853723 A1	14-11-2007
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